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PART I – SECTION C
DESCRIPTIONS/SPECIFICATIONS/STATEMENT OF WORK

C.1.0 SCOPE OF CONTRACT

This contract is for the purchase of Distance Measuring Equipment (DME) systems to support enroute, terminal, Commercial Aviation Safety Team (CAST), sustain, new establish, and RNAV requirements. The contractor shall deliver DME equipment in accordance with FAA Specification FAA-E-2996 for stand alone and co-location with Very High Frequency Omnidirectional Range (VOR) and Instrument Landing Systems (ILS).

The contractor shall deliver all equipment, and contractor support services required for the support of all items under this contract. The equipment, spare parts, documentation and contractor support services shall be supplied in accordance with the requirements of this Statement of Work (SOW) and at the prices listed in Section B thereof.

C.2.0 DOCUMENTS

C.2.1 PRECEDENCE

In case of conflict between provisions of this contract, the following order of precedence is established.

- a. Part I - Sections A – H
- b. Contract Clauses – Part II - Section I
- c. Attachments – Part III - Section J
- d. FAA-E-2996 Specification
- e. Other FAA Specifications
- f. Other FAA Documents (other than Specifications)
- g. FAA/DOT Standards and Orders
- h. DoD Standards and Orders
- i. Other documents incorporated by reference

The following documents are applicable to the extent herein. Unless otherwise stated, the latest version of these documents as of the contract date shall apply.

C.2.2 FAA DOCUMENTS

FAA-C-1217f	Electrical Work, Interior, 2/26/96
FAA-D-2494/b	Technical Instruction Book Manuscript: Electronic, Electrical, and Mechanical Equipment, 3/14/84

FAA-E-2996	Performance Specification Distance Measuring Equipment (DME), 4/1/08
FAA-G-2100H	Electronic Equipment, General Requirements 5/9/05
FAA-STD-002F	Standard Engineering Drawing Preparation and Support 6/17/05
FAA-STD-019e	Lightning and Surge Protection, Grounding, Bonding, and Shielding Requirements for Facilities and Electronic Equipment 12/22/05
FAA-STD-025F	Preparation of Interface Documents 11/30/07
FAA-STD-026A	Software Development for the National Airspace System, (NAS) dated 6/1/01
FAA-STD-028C	Contract Training Programs 11/16/00
FAAD-STD-1293D	Servicing Standards and Test Requirements for Ground Electronics Equipment, 9/21/06
FAA-HDBK-006A	Reliability, Maintainability, and Availability (RMA) Handbook 1/7/08
NAS-IC-51070000-2	NIMS Interface Control Document 1/02
FAA Order 1800.66	Configuration Management Policy, 12/00
FAA Order 3900.19	FAA Occupational Safety and Health Program, 4/29/99
FAA Order 6750.49	Maintenance of ILS Facilities, 7/28/99
FAA Order 8040.4	Safety Risk Management, 6/1/98
FAA Order 8110.49	Software Approval Guidelines, 6/2/03
FAA Order 8110. 105	Simple and Complex Electronic Hardware Approval Guidance, 7/16/08
ATO-S 2006-1 ver 1.4a	Safety Risk Management Guidance for Systems Acquisition (SRMGSA), 2/8/07
AC 150/5345-43F	Specification for Obstruction Lighting Equipment 9/12/06

C.2.3 FEDERAL DoD, MILITARY STANDARDS AND SPECIFICATIONS

MIL-DTL-31000B	Technical Data Packages 12/14/01
MIL-STD-461E	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment 8/20/99
MIL-STD-810G	Environmental Engineering Considerations and Laboratory Tests 10/31/08
MIL-STD-882D	Standard Practice for System Safety 2/10/00
MIL-STD-2073-1D	DOD Standard Practice for Military Packaging 5/10/02
MIL-HDBK-470A	Designing and Developing Maintainable Products and Systems 8/4/97
MIL-HDBK-781A	Reliability Test Methods, Plans, and Environments for Engineering Development, Qualification, and Production 04/01/96
MIL-HDBK-217F	Reliability Prediction of Electronic Equipment, 2/28/95

MIL-HDBK-61A
MIL-PRF-49506

Configuration Management 2/7/2001
Logistics Management Information 11/11/96

C.2.4 OTHER DOCUMENTATION

ANSI/EIA-649A	National Consensus Standard for Configuration Management, 2004
ANSI/ISO/ASQC Q9001-2000	Quality Management Systems – Requirements
ASTM D 3951-98	Standard Practice for Commercial Packaging, 04
ISO/IEC 15438	Barcode Symbology Specifications, 01
29 CFR 1910	Occupational Safety and Health Standards (OSHA) General Industry Regulations,
29 CFR 1926	OSHA Construction Industry Regulations,
RTCA DO-178	Software Considerations in Airborne Systems and Equipment Certification, 12/1/98
RTCA DO-278	Guidelines for Communication, Navigation, Surveillance, and Air Traffic Management (CNS/ATM) Systems Software Integrity Assurance, 3/5/02
RTCA DO-254	Design Assurance Guidance for Airborne Electronic Hardware, 4/19/00
SAE ARP-4754	Aerospace Recommended Practice: Certification Considerations for Highly-Integrated or Complex Aircraft Systems, Society of Automotive Engineers (SAE), 11/96
SAE ARP-4761	Aerospace Recommended Practice: Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment, SAE, 12/96
IEEE 730-2002	Standard for Software Quality Assurance Plans, 9/23/02

C.2.5 COPIES OF DOCUMENTS

Copies of FAA specifications and interface documents may be obtained from the Federal Aviation Administration, Headquarters Public Inquiry Center: APA-200, 800 Independence Avenue SW, Washington, DC 20591, 202-267-3484. Requests should fully identify material desired and cite the solicitation or contract number.

Requests for copies of documents not covered in the preceding paragraph should be addressed to the Contracting Officer. Requests should fully identify the material desired and cite the solicitation or contract number.

Military Standards and Specifications can be ordered from the Department of Defense Single Stock Point (DODSSP), Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. Information is available at its website, <http://assist.daps.dla.mil>.

Copies of ANSI/ASQC-Q-9001-2000 can be obtained from the following source:
American Society for Quality Control, 611 East Wisconsin Avenue, P.O. Box 3005,
Milwaukee, Wisconsin 53201-3005. Phones: (414) 272-8575 or (800) 248-1946. Fax:
(414) 272-1734.

C.3.0 REQUIREMENTS

C.3.1 PERFORMANCE REQUIREMENTS

This contract shall be performed in accordance with (IAW) Specification FAA-E-2996, Performance Specification, Distance measuring Equipment (DME) and this SOW. The Contractor shall provide systems engineering, human engineering, program management, integrated logistic support management, quality assurance, configuration management, training, operational support, and material/support to manufacture/integrate, develop, test, and deliver DMEs IAW this SOW.

The CO or designee shall approve all items delivered in response to this SOW. All references to the "Government" or "FAA" in this SOW mean by authority of the CO or designee.

The Contractor shall produce the data items referenced by Contract Data Requirements List (CDRL) titles IAW the CDRL of the same name. All data deliverables must be prepared and delivered IAW the corresponding Data Item Description (DID) specified in the CDRL. Unless otherwise specified the Contractor must deliver all CDRLs IAW Sections 14 and 16 of the CDRL.

C.3.2 SYSTEM REQUIREMENTS

The DME shall be of solid state, modular construction and have a continuously engaged backup power supply which enables operation for a minimum of four (4) hours at 90% of the maximum interrogation rate subsequent to a failure of the primary AC power input. The DME electronics shall be housed in a single or dual cabinet(s) capable of between 100 and 1000 watt output and shall be capable of supporting the antennas in C.3.3. The electronics cabinet(s) shall be capable of being installed in currently existing shelters without modification to the cabinet(s) or shelter.

C.3.3 DME EQUIPMENT DESCRIPTION

For the purpose of this contract the DME system shall consist of the following:

- a. Detailed CLIN description TBD

- b. One of the below type antennas:
 - 1) Omni-directional
 - 2) Bi-directional
 - 3) Uni-directional
- c. One DME installation/integration kit in accordance with C.3.3.1.
- d. Special Tools and Test Equipment (ST&TE) in accordance with C.3.3.3.
- e. All required operational and maintenance software.
- f. Two complete sets of Technical Instruction Books in accordance with C.3.10.9

C.3.3.1 DME Installation/Integration Kit

The DME installation/integration kit shall contain a battery kit, cables and connectors between all deliverable DME equipment, cabinet/racks, and all other hardware required to provide and install a complete DME. This shall include fasteners, wall mounting hardware and any other equipment necessary. The kit shall also include antenna obstruction lights with 75 ft of AC connecting cable for the lights and a mounting adapter to install the antenna on a 4 inch outside diameter (OD) pipe. Cable shall include:

- a. Coaxial Cable from the DME cabinet to the antenna. Cable length shall be 75 feet minimum. One end of the cable shall be terminated with a male N-type connector.
- b. Coaxial Cable for the DME monitor antenna output. Cable length shall be 75 feet minimum. One end of the cable shall be terminated with a male N-type connector.

- c. AC power cables and connectors.

Installation/integration shall be done in accordance with (IAW) FAA-C-1217 and FAA-STD 19. The obstruction lights shall be Light Emitting Diode (LED) lights in accordance with FAA Advisory Circular 150/5345-43.

C.3.3.2 First Article

The contractor shall provide three First Articles in accordance with paragraph C.3.8 below. The purpose of the three First Articles is to provide equipment for Government field-testing of the equipment to be supplied under this contract. All First Articles shall be identical in design and parts and shall be configured in accordance with paragraphs C.3.3 and C.3.3.1 above.

C.3.3.3 Special Tools and Test Equipment

Special Tools and Test Equipment (ST&TE) are tools and test equipment peculiar to the DME which are not readily available from other commercial sources and which are required for performing operational and maintenance tasks at the site. ST&TE includes test cables, connectors, extender kits, adapters, software, documentation/maintenance manuals, and all other ancillary items required to permit use of the special test equipment with DME hardware. Deliverable ST&TE shall be as listed in Attachment J-2. The Contractor shall notify the Government of revisions to Attachment J-2, List of Special Tools and Test Equipment as approved configuration, equipment, or data change.

C.3.4 PROGRAM MANAGEMENT

The Contractor shall maintain a formal organization to manage the contract and subcontracts, including, at a minimum, program control, quality assurance, configuration management, management of Government furnished resources, risk management, and security. The management organization, techniques, tasks, and procedures shall be documented in an approved Program Management Plan (PMP).

CDRL A001 Program Management Plan

C.3.4.1 Program Manager

The Contractor shall assign a Program Manager to be responsible for the cost, schedule and performance of the program and to report on all elements of the contract. The Program Manager shall be responsible to present and discuss the status of contract activities with the Government at any time. The Program Manager must be identified in the Contractor's proposal as a Key Personnel. The Government shall be notified in writing one month prior to a change in the Program Manager. Notification shall include

the reason for the change and any cost, schedule, or performance impacts associated with this change.

C.3.4.2 Status Reports

The Contractor shall submit Quarterly Program Status Reports throughout the period of the contract IAW the CDRL below.

CDRL A002	Quarterly Program Status Report
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C.3.4.3 Meetings, Conferences and Reviews

The Contractor shall conduct meetings, conferences and reviews in accordance with this statement of work. The Contractor shall prepare and submit agendas and minutes. When meetings or conferences are held at the Contractor's site, the Contractor shall provide facilities and office equipment (e.g., access to telephone and fax), internet access, sub-Contractor personnel when requested, and appropriate presentation materials, mockups, and technical data. Copies of presentation materials shall be prepared for all meeting participants.

CDRL A003	Meeting Agenda
CDRL A004	Meeting Minutes

C.3.4.4 Post Award Conference

A post award conference shall be held at the Contractor's facility not later than (1) month after contract award. The agenda will be developed jointly between the Contractor and the Government and shall contain as a minimum contract responsibilities, technical, logistic, and management and deliverable schedules to include a preliminary master program schedule.

In conjunction with the Post Award Conference, the Contractor shall conduct a Logistic Guidance Conference (LGC). The Contractor shall prepare a briefing package handout and present its approach to accomplishing logistics tasks. The LGC will be a forum for discussion of provisioning requirements and issues, including at a minimum, provisioning deliverables, data requirements, technical documentation, data for provisioning, maintenance planning, supply support/provisioning, support and test equipment, technical data, and manpower and personnel for training. This conference shall last no longer than two days.

CDRL A003	Meeting Agenda
CDRL A004	Meeting Minutes

C.3.4.5 Program Overview Meetings

Program Overview Meetings (POMs) shall be held quarterly from Critical Design Review through the following year. POMs will be held bi-annually from then on or until the Contracting Officer deems that regularly scheduled meetings are no longer necessary, whichever is earlier. POMs shall be held at the Contractor's facility. During POMs the Contractor shall present detailed contract status, discuss and track outstanding action items, review potential and actual technical and programmatic problem areas and proposed solutions, describe performance relative to milestones set forth in the PMP, and provide a forum for highlighting activity planned for the next period.

CDRL A003	Meeting Agenda
CDRL A004	Meeting Minutes

C.3.4.6 Technical Interchange Meetings

The Government or the Contractor may request Technical Interchange Meetings (TIMs) between the Contractor and the Technical Officer or his or her designated representative. Meetings may be held at either Contractor or Government facilities or may be conducted by telephone if appropriate. The purpose of a TIM is to discuss specific technical activities, including action items, studies, test plans, test results, design issues, technical decisions, and implementation concerns to ensure continuing visibility into technical progress. A maximum of 5 Government-requested TIMs per year may be held at the Contractor's facilities during performance of the contract. There shall be no limit on Contractor-requested or telephonic TIMs.

CDRL A003	Meeting Agenda
CDRL A004	Meeting Minutes

C.3.5 DESIGN REVIEWS

The Contractor shall conduct four (4) formal Design Reviews. Prior to each Design Review:

- a. All contract CDRLs scheduled up to the date of the review shall have been submitted and will be a part of the presentation material.
- b. The Contractor shall assemble specified data at its facility to be available for Government review in support of the Design Review.
- c. All key Contractor management and design engineering personnel having responsibility in the areas to be discussed shall be available to attend the reviews.
- d. The Contractor will provide a copy of the review briefing package to the Contracting Officer's Technical Representative electronically at least 10 calendar

days before the Design Review. A meeting agenda and meeting minutes shall be required.

C.3.5.1 System Requirements Review (SRR)

The Contractor shall host a SRR meeting not later than two (2) months after contract award. The purpose of the SRR portion is to confirm that the Contractor sufficiently understands the system-level requirements so that the Contractor can establish an initial system-level functional baseline. This baseline establishes the functional, performance, and physical attributes of the physical elements required to satisfy all the system's functionalities.

To complete the SRR, the Contractor must demonstrate that the FAA's requirements have been translated into system-specific technical requirements, critical technologies are identified, required technology demonstrations are planned to ensure compatibility with design requirements, and that risks are well understood. The Contractor must also show that mitigation plans are in place to address identified risks.

At a minimum, the Contractor must provide all documentation pertaining to the following topics for review at SRR:

- a. System Requirements,
- b. Interface Control Documents (ICD) and interface requirements,
- c. Functional Analysis (top-level block diagrams),
- d. Preliminary System Architecture,
- e. System Maintenance Concept,
- f. Significant System Design Criteria (reliability, maintainability, logistics requirements, etc.),
- g. System-Engineering Planning,
- h. Top-Level Technical Performance Measurement,
- i. System Design Documentation (layout drawings, conceptual design drawings, selected supplier components data, etc.),
- j. Human Engineering (HE),
- k. Information Security, and

1. System Safety.

Information and documentation obtained during the SRR will be documented in the SRR minutes. Approval of the SRR minutes is approval of the SRR milestone.

CDRL A003	Meeting Agenda
CDRL A004	Meeting Minutes

C.3.5.2 System Design Review (SDR)

The Contractor shall host a SDR meeting not later than one month after approval of the SRR minutes. The purpose of the SDR is to evaluate the optimization, correlation, completeness, and risks associated with the allocated technical requirements. This review will also include a summary review of the systems engineering process, which produces the allocated technical baseline and system architecture for the DME. Basic manufacturing and lifecycle considerations will be reviewed. This review will be conducted when the system definition effort has proceeded to the point where system characteristics are defined and configuration items identified.

The Contractor must establish the DME allocated baseline to complete SDR. All documents to establish the allocated baseline must be reviewed and approved as part of SDR.

At a minimum, the Contractor must provide all documentation pertaining to the following topics for review at SDR:

- a. System Architecture (update),
- b. System Requirements (update),
- c. System Safety (update),
- d. Subsystem Requirements,
- e. Subsystem Hardware Requirements,
- f. Subsystem Software Requirements (including controller and maintainer interfaces),
- g. Subsystem Interface Requirements, and
- h. Identification of LRUs for Bar Coding asset tracking purposes. This function may be unnecessary if it was accomplished at the Provisioning Conference.

Information and documentation obtained during the SDR will be documented in the SDR minutes. Approval of the SDR minutes is approval of the SDR milestone.

CDRL A003 Meeting Agenda
CDRL A004 Meeting Minutes

C.3.5.3 Preliminary Design Review

The Preliminary Design Review (PDR) shall be held not later than six (6) months after contract award. Its purpose is to evaluate progress, technical adequacy, and risk resolution in development of the allocated design and, at a minimum, for the Contractor to:

- a. Identify the responsible company unit for the system hardware/software development, manufacturing, integration, and testing.
- b. Define the functional baseline of the product.
- c. Compare the current baseline with the FAA's functional baseline.
- d. Identify all functional requirements of FAA-E-2996 and derived requirements in a matrix format.
- e. Present a diagram(s) how the functional requirements flow down to the design.
- f. Demonstrate the understanding of the guidance documents by application of appropriate tools, internal processes and technical support and how they will be applied/flow down the requirements to the system design.
- g. Identify all inherent risks and provide analysis mitigating the risks of the program to an acceptable level.
- h. Present detailed descriptions of their management controls and processes.
- i. Present preliminary system level design approaches in a comparative format that addresses, as a minimum, functional requirements, risk, schedule, Hazardous Misleading Information (HMI), obsolescence, availability, maintainability and reliability.
- j. Present a preliminary master schedule.

CDRL A003 Meeting Agenda
CDRL A004 Meeting Minutes
CDRL B001 Preliminary Design Review Data

C.3.5.4 Critical Design Review

The Critical Design Review (CDR) shall be held not later than nine (9) months after the PDR has been approved by the government. Its purpose is to determine whether the detailed design meets the specified requirements in the appropriate developmental baseline, whether the design is complete and ready to be implemented via detailed software code and test, and at a minimum, for the Contractor to:

- a. Present an updated PMP that addresses all areas of development, quality and CM control, HW/SW development, program integration and validation, and logistic supportability based on PDR approval.
- b. Present design data to prove that the design approved at the PDR was synthesized as presented in the PDR. The design data shall be detailed, clear, and all inclusive to assure all lower level requirements have been met, all safety requirements have been addressed, and the level of risk has been identified with proposed mitigation.
- c. Present initial design documents (Hardware/Software, Source Code, ICDs ,etc.) for discussion in order to demonstrate how they relate to the requirements and how they were incorporated in the system design.
- d. Present a Preliminary Hazard Analysis (PHA) that assures that all risks identified in the Operational Safety Assessment (OSA) have been mitigated to an acceptable level through the system design.
- e. Present a preliminary System Safety Program Plan (SSPP) that assures that the program's procedures, testing, and analyses will validate that the system will be safe for use in the NAS.
- f. Present initial plans to conduct a Reliability Demonstration in accordance with Paragraph C.3.8.2.2 and a Maintainability Demonstration in accordance with Paragraph C.3.8.2.3.
- g. Present a final master schedule.

CDRL A003	Meeting Agenda
CDRL A004	Meeting Minutes
CDRL B002	Critical Design Review Data

C.3.6 QUALITY ASSURANCE

The Contractor shall establish and maintain a documented quality system compliant with the requirements of ANSI/ISO/ASQ Q9001-2000, Quality Management Systems – Requirements. The Contractor shall submit a Quality System Plan (QSP) in accordance with ANSI/ISO/ASQ Q9001-2000 describing the Contractor's quality system and its applicability to the contract to assure the delivery of products and services in conformance with all contractual requirements. Third party certification of International

Standards Organization ISO standards is not required nor does such certification relieve the Contractor of the requirement for submitting a QSP.

CDRL C001 Quality System Plan

C.3.7 CONFIGURATION MANAGEMENT

C.3.7.1 Configuration Management (CM) Planning

The Contractor shall develop a CM Plan and establish, implement, and maintain a CM program using MIL-HDBK-61 and ANSI/EIA-649 for guidance. The CM program shall be documented using MIL-HDBK-61, Appendix A. The CM program shall cover the Contractor's CM organizational structure and methods of configuration identification, change control, configuration status accounting, and configuration auditing for documentation, physical media and physical parts representing or comprising the DME. The Contractor shall maintain configuration control of hardware, software, firmware, and developmental/commercial documentation until delivery of the last ordered production unit, subject to configuration change control requirements specified below. The Contractor shall identify the single focal point, under the Program Manager, who will serve as the primary point of contact for all communication on CM-related issues.

CDRL D001 Configuration Management Plan

C.3.7.2 Configuration Item (CI) Identification

The Contractor shall identify, establish, and maintain the configuration of the DME and its subordinate configuration items. This shall include the following:

- a. Selecting developmental and commercial configuration items at appropriate levels of the product structure to facilitate the documentation, control and support of the items and their documentation;
- b. Determining the types of configuration documentation required for each configuration item (CI) to define its performance, functional and physical attributes, including internal and external interfaces;
- c. Determining the appropriate configuration control authority for each configuration document consistent with logistic support planning for the associated CI;
- d. Issuing identifiers for the CIs and the configuration documentation. This includes FAA nameplates in accordance with FAA-G-2100, Section 3.3.3. The

Government will provide written instructions on nameplate content data (e.g. FAA Type Number).

- e. Maintaining the configuration identification of CIs to facilitate effective logistics support of items in service;
- f. Releasing configuration documentation; and
- g. Establishing configuration baselines for the configuration control of CIs.

The Contractor shall assign a discrete part/identification number to each software version, containing release or build type software executables.

C.3.7.3 Configuration Control

The Contractor shall maintain and demonstrate a systematic life cycle configuration change management process for the DME as described in the CM Plan. This change management process, using MIL-HDBK-61, Section 6, and ANSI/EIA-649, as guidance, shall manage the preparation, justification, evaluation, coordination, disposition, and implementation of proposed engineering changes and deviations to the DME system hardware, software and firmware, and baselined configuration documentation. The Contractor shall integrate the FAA DME into its ongoing change management activities upon successful completion of Functional and Physical Configuration Audits.

C.3.7.4 Engineering Change Proposals (ECP)

Changes to established Contractor or Government formal CM baselines require an appropriately classified (Class I (Major) or Class II (Minor)) Engineering Change Proposal (ECP). The Contractor's CM Plan and Change Management procedures shall describe the processes for the submission, justification, evaluation, coordination, disposition, and implementation of ECPs IAW MIL-HDBK-61, Section 6. Contracting Officer approval is required before any changes are incorporated into baselined CIs and associated documentation. All ECPs, Class I or II must be approved by the Contracting Officer's Technical Representative (COTR) before the changes can be incorporated in the system.

CDRL D002 Engineering Change Proposals

C.3.7.5 Requests for Deviations or Waivers

The Contractor shall submit a request for deviation or waiver prior to departing from the approved engineering baseline for a specific number of units or a specified period of time in accordance with the guidance contained in MIL-HDBK-61, Section 6. Deviations

shall be for less than the production quantity of the item, and shall not require changes to any DME baseline documentation.

CDRL D003 Request for Deviation or Waiver

C.3.7.6 Configuration Status Accounting (CSA)

- a. The Contractor shall maintain the configuration baseline for the DME and the required documentation to support the baseline IAW MIL-HDBK-61, Section 6. The Contractor shall record as a minimum the following information for configuration status accounting:
 - 1) Current approved configuration documentation associated with each configuration item;
 - 2) Status of proposed engineering changes and deviations from initiation to approval and status of their implementation;
 - 3) Results of configuration audits including disposition of actions;
 - 4) Traceability of changes;
 - 5) Status of the implementation of changes at all locations; and
 - 6) Identifiers of electronic documentation and software that have been delivered.
- b. Current CSA information shall be included in POM presentations and shall be available for review at the Contractor's facility by FAA personnel or designated representatives.

C.3.7.7 Configuration Verification and Audits

The approved Product Baseline shall be established after successful completion of the Functional Configuration Audit (FCA) and Physical Configuration Audit (PCA), conducted using MIL-HDBK-61, Section 8 as guidance. The Contractor shall prepare and submit a Configuration Audit Plan for FCA/PCA. The Contractor shall be responsible for ensuring that sub-contractors, vendors, and supplier's configuration items are part of the audit process. FCA must be completed and approved prior to the start of PCA.

CDRL D004 Configuration Audit Plan

C.3.7.7.1 Functional Configuration Audit (FCA)

The FCA shall be conducted by the contractor and witnessed by the Government representatives using MIL-HDBK-61, Section 8 as guidance. The purpose of the FCA is to validate that the actual performance of the DME meets the requirements stated in FAA-E-2996. The Contractor shall develop and maintain a Traceability Matrix identifying the specification requirements and cross-referencing them to the test plans/procedures/results, analysis documents, inspection reports and demonstration records. FCA will be scheduled when the Contractor has:

- a. Obtained approval of a FCA Traceability Matrix CDRL
- b. Successfully completed First Article testing using Government approved test plans/procedures and reports
- c. Assembled all Government approved analyses, reports and inspection and demonstration results

The Contractor shall develop an FCA report documenting the findings of the FCA and listing actions taken to correct deficiencies. The FCA is considered complete when the Contractor has demonstrated that all FCA requirements have been successfully validated and no critical action items remain.

CDRL D005	<u>Functional Configuration Audit (FCA) Traceability Matrix</u>
CDRL D006	<u>Functional Configuration Audit (FCA) Report</u>

C.3.7.7.2 Physical Configuration Audit (PCA)

- a. The Contractor shall conduct a PCA, witnessed by the Government representatives using the approved First Article system at its facility.
- b. The PCA shall be conducted using MIL-HDBK-61, Section 8, as guidance. The purpose of the PCA is to ensure that the as-built product configuration documentation matches the as-delivered design. The Contractor shall provide a complete set of released drawings, indentured parts list, system diagrams, system configuration documentation, access to status accounting documentation, and a system for the audit. The Contractor shall develop a PCA Report documenting the findings of the PCA and listing actions taken to correct deficiencies. The PCA will not be approved until the Contractor has resolved all discrepancies identified during the audit.

The PCA and FCA will be approved when the contracting officer notifies the contractor.

CDRL D007	<u>Physical Configuration Audit (PCA) Report</u>
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C.3.7.8 Product Baseline Transfer

Management of the DME Product Baseline transfers to the FAA upon successful completion of verification and audit activities that result in a verified system/configuration item design and a documentation set that may be considered a product design baseline. The Contractor shall maintain configuration control of the DME hardware and software baseline documents until it transfers to the FAA upon delivery of the last production DME system and in conjunction with the delivery of the final copy of the Technical Data Package (TDP).

The product baseline may include engineering drawings, Technical Instruction Book, software code, software platform, Interface Control Documents, B-level specifications, and test program sets (TPS). The FAA will provide the Contractor a final list by descriptive name and version of the CDRL documents considered part of the Product Baseline Transfer upon completion of all audit activities. The Contractor shall transfer management of the product baseline to the FAA even if the Contractor is retained to provide second level engineering support.

C.3.8 SYSTEM TEST AND EVALUATION

System Test and Evaluation shall be, as a minimum, comprised of:

- First Article Test
 - Design Qualification Tests
 - Reliability Demonstration
 - Maintainability Demonstration
 - Environmental Demonstration
 - Electromagnetic Interference Demonstration
 - Fail-Safe Demonstration
- Production Acceptance Test
- Type Test

C.3.8.1 Test and Evaluation Management

The Contractor shall fully integrate and coordinate all testing to be performed according to FAA-E-2996 and this SOW. The contractor is responsible for planning, test procedures, testing, data collection, analysis, and providing all required test documentation. A single Test Manager shall be assigned with the responsibility for integration, control and coordination of all Contractor testing and Contractor support of Government testing. The Test Manager shall inform the Quality Reliability Officer (QRO) and COTR at least 5 working days prior to the conduct of any formal test. All test

results must be signed and dated by the QRO and the Contractor QA Officer before being submitted for acceptance.

The contractor shall develop a Contractor's Master Test Plan (CMTP) for government review and approval. The CMTP shall contain a Verification Requirements Traceability Matrix that traces all the technical and performance requirements as specified in the FAA-E-2996 and the contract.

CDRL E001 Contractor's Master Test Plan

C.3.8.2 First Article Test

The Contractor shall conduct the First Article Test (FAT) at the Contractor's facility to verify that the implemented design meets all functional and performance requirements of FAA-E-2996, Table 1. Verification Requirements Traceability Matrix, and the contract. The Contractor shall develop FAT Plans, FAT Procedures, and FAT Report in accordance with the CDRLs listed below.

FAT will not start until the Contractor has:

- a. Established and controlled the HW/SW configuration in accordance with paragraph C.3.7.1,
- b. Obtained Government approval of the FAT Plan, and FAT Procedures

FAT will not be considered complete until the Contractor has:

- a. Completed all First Article Tests and Demonstrations as shown in C.3.8 above,
- b. Executed all test procedures, witnessed by the Government,
- c. Generated Problem Technical Reports (PTRs) for each failure,
- d. Resolved all PTRs. Any change made to the hardware/software in order to resolve a PTR shall be successfully tested using the original test procedures.
- e. Provided an updated Reliability Analysis based on the approved production DME configuration identified in Section C.3.3,
- f. Obtained Government approval of test reports.

CDRL E002 FAT Plan
CDRL E003 FAT Procedures
CDRL E004 FAT Report

C.3.8.2.1 Design Qualification Test

The Contractor shall conduct formal Design Qualification Test (DQT) at the Contractor's facility to verify that the implemented design meets functional and performance requirements of FAA-E-2996 and the contract, and specifically meets the requirements for reliability, maintainability, environmental and electromagnetic interference (EMI).

The Contractor shall develop DQT Plans, DQT Procedures, and DQT Reports in accordance with the guidance contained in the CDRLs listed below.

DQT will not start until the Contractor has:

- a. Established and controlled the HW/SW configuration in accordance with paragraph C.3.7.1,
- b. Obtained Government approval of the DQT Plan, and DQT Procedures

DQT will not be considered complete until the Contractor has:

- a. Successfully executed all test procedures, witnessed by the Government,
- b. Generated Problem Technical Reports (PTRs) for each failure,
- c. Resolved all PTRs. Any change made to the hardware/software in order to resolve a PTR shall be successfully tested using the original test procedures.
- d. Obtained Government approval of test reports.

CDRL E005	DQT Plan
CDRL E006	DQT Procedures
CDRL E007	DQT Report

C.3.8.2.2 Reliability Demonstration

The Contractor shall conduct a Reliability Demonstration at the Contractor's facility in accordance with applicable sections of FAA-E-2996. The demonstration shall consist of the testing of two (2) systems as described in C.3.3 for a minimum period of 4000 hours each. Each system shall undergo a Reliability Demonstration under the following conditions.

- a. The demonstration shall be conducted with each system operating at ambient room temperature (nominal 25 degrees Centigrade \pm 5 degrees Centigrade with no climate control for the total number of hours).

- b. Any one critical failure will constitute a failed reliability demonstration. A critical failure is one that results in a cessation of service.
- c. The Contractor shall seal each subsystem to prevent any unauthorized access to the DME systems under test.
- d. The reliability demonstration shall be conducted using single equipment systems operating with an antenna or antenna simulator.
- e. The following equipment/systems configuration shall be tested during the Reliability Demonstration: Two (2) complete HPDME with one antenna for each system.

The Reliability Demonstration shall not start until the Contractor has:

- a. Successfully completed DQT or PAT on the First Articles designated for the Reliability Demonstration,
- b. Established and controlled the HW/SW configuration in accordance with paragraph C.3.7.1,

The Reliability Demonstration shall not be considered complete until the Contractor has:

- a. Successfully completed the test, witnessed by the Government as applicable,
- b. Generated Problem Technical Reports (PTRs) for each critical and non critical failure,
- c. Resolved all PTRs to the extent that the PTRs have been fixed and tested or deferred to a later release with Government approval,
- d. Obtained Government approval of the Reliability Demonstration Report.

The Contractor shall develop the Reliability Demonstration Plan, Procedure, and Report in accordance with the CDRLs listed below.

CDRL E008	Reliability Demonstration Plan
CDRL E009	Reliability Demonstration Procedures
CDRL E010	Reliability Demonstration Report

C.3.8.2.3 Maintainability Demonstration

The Contractor shall conduct a Maintainability Demonstration at the Contractor's facility in accordance with the guidance contained in MIL-HDBK-470, Appendix B, Test Method 9. The purpose of the Maintainability Demonstration is to demonstrate the adequacy of the Air Traffic System Specialist (ATSS) training materials and the DME fault isolation and mean time to repair requirements.

- a. The FAA intends to use Contractor trained Government Airway Transportation System Specialist (ATSS) technicians to perform the maintenance procedures to be demonstrated during the conduct of the Maintainability Demonstration. The Contractor shall conduct a familiarization training for the FAA ATSS personnel prior to the Maintainability Demonstration.
- b. The Contractor shall propose, in the Maintainability Demonstration Plan, 90 candidate faults for insertion into pre-faulted modules. The candidate faults shall include at least two types of faults for each configuration item. The Contractor shall develop pre-faulted modules for the 20 faults selected by the Government from the list of 90 for use in the Maintainability Demonstration. In addition, the Government may independently direct the contractor to insert up to two non-candidate faults per configuration item.

The Maintainability Demonstration shall not start until the Contractor has:

- a. Successfully completed DQT or PAT on the First Article designated for the Maintainability Demonstration,
- b. Conducted familiarization training for FAA ATSS test personnel,
- c. Developed pre-faulted modules based on Government selection of faults,
- d. Established and controlled the HW/SW configuration in accordance with paragraph C.3.7.1, and
- e. Obtained Government approval of the Maintainability Plan and Procedures

The Maintainability Demonstration shall not be considered complete until the Contractor has:

- a. Successfully executed all test scripts, witnessed by the Government,
- b. Generated Problem Technical Reports (PTRs) for each failure,
- c. Resolved all PTRs to the extent that the PTRs have been fixed and tested or deferred to a later release with Government approval, and
- d. Obtained Government approval of the Maintainability Demonstration Report.

The Contractor shall develop the Maintainability Demonstration Plan, Procedure, and Report in accordance with the CDRLs listed below.

CDRL E011 Maintainability Demonstration Plan

C.3.8.2.4 Environmental Demonstration

The Contractor shall conduct an Environmental Test in accordance with MIL-STD-810 and FAA-G-2100. The contractor shall use the temperature profile in Attachment J-3. The Contractor shall develop the Environmental Demonstration Plan, Procedure, and Report in accordance with the CDRLs listed below.

CDRL E012	<u>Environmental Demonstration Plan</u>
CDRL E013	<u>Environmental Demonstration Procedures</u>
CDRL E014	<u>Environmental Demonstration Report</u>

C.3.8.2.5 Electromagnetic Interference (EMI) Demonstration

The Contractor shall conduct an Electromagnetic Interference (EMI) Test in accordance with FAA-G-2100 and MIL-STD-461 Section 5. Paragraphs 5.5, 5.6, 5.8, 5.16, and 5.19 of MIL-STD-461 shall apply. The purpose of the EMI testing is to verify requirements for the control of the electromagnetic interference characteristics of electronic, electrical, and electromechanical equipment and subsystems.

The Contractor shall develop the EMI Demonstration Plan, Procedure, and Report in accordance with the CDRLs listed below.

CDRL E015	<u>EMI Demonstration Plan</u>
CDRL E016	<u>EMI Demonstration Procedures</u>
CDRL E017	<u>EMI Demonstration Report</u>

C.3.8.3 Production Acceptance Test

The Contractor shall conduct Production Acceptance Tests (PAT) at the Contractor's facility for the DME system to verify that it conforms to FAA-E-2996 and other applicable specifications, is free from manufacturing defects, and is identical in form, fit, and function to the approved First Article. The Contractor shall develop a PAT Plan, PAT Procedures, and PAT Reports in accordance with CDRLs listed below.

The PAT will not start until the Contractor has:

- a. Passed the First Article Tests and Demonstrations (See C.3.8.2)
- b. Completed the System Safety Assessment Report (SSAR) (See C.3.13.2.4)
- c. Established and controlled the HW/SW baselines
- d. Obtained Government approval of the PAT Plan, and PAT Procedures,
- e. Obtained Government approval of the Fail-Safe Demonstration Test Report.

The PAT will not be considered complete until the Contractor has:

- a. Successfully executed all test procedures, witnessed by the Government,
- b. Generated Problem Technical Reports (PTRs) for each failure,
- c. Resolved all PTRs and tested successfully as required.

CDRL E018	PAT Plan
CDRL E019	PAT Procedures
CDRL E020	PAT Report

C.3.8.4 Type Test

The Contractor shall assign sequential numbers to the DME as they reach the stage of completion and readiness for testing. Using these sequential numbers, the Contractor shall divide the equipment into groups for Type Test as shown in the Table A. The Contractor shall conduct Type Test on one system from each group. The QRO will select the specific DME for test. The Contractor shall develop a Type Test Plan, Type Test Procedures, and Type Test Report.

The Contractor shall conduct Type Test on each production DME system for selected production systems in accordance with Table below.

Type Test will consist of the FAT and a Reliability Test on one (1) system from each Type Test Group in accordance with procedures in paragraphs C.3.8.2 and C.3.8.2.2.

	Type Test Groups							
	1	2	3	4	5	6	7	8
System ID #s	3 (First Articles)	4-25	26-75	76-125	126-175	176-225	226-250	251-300

CDRL E021	Type Test Plan
CDRL E022	Type Test Procedures
CDRL E023	Type Test Report

C.3.9 SYSTEM HARDWARE/SOFTWARE SUPPORT

C.3.9.1 Government Support Environment

The Government will set up a hardware/software support environment at the FAA National Airway Systems Engineering Office, Oklahoma City, OK, as early as possible to verify that manufacturer developed hardware/software development methods and procedures are properly documented and that the software can be independently built and can produce an identical product on a different software platform.

To support this effort, the Contractor shall deliver all source code and documentation required to independently maintain, troubleshoot, develop changes or modifications, and build software code and/or firmware for the system and/or auxiliary units. Contractor modified tools, and specific software (code) developed by the manufacturer to provide checksum, CRC insertion, or for programming flash devices (PROMs) or performing system tests shall also be delivered. Tools are typically, but are not limited to, compilers, assemblers, locate tools, device programming software, and programming equipment or fixtures used (i.e., for programming EPROMs, PROMs, EPLDs). Government rights to software and data shall be in accordance with Section H.x, Data Rights.

C.3.9.2 Interface Control Documents

C.3.9.2.1 Remote Maintenance Monitoring (RMM) Interface

The DME shall have an open system interface architecture and shall have embedded RMM capability that meets, as a minimum, the requirements specified in FAA-E-2996 specification. The contractor shall provide an Interface Control Document (ICD) that fully describes the RMM interface of FAA-E-2996 to enable the government to independently develop an interface to its maintenance control center.

The Contractor shall prepare and submit separate Interface Control Documents (ICDs) for interfaces between DME equipment and the following:

- a. Remote Maintenance Monitoring (RMM)
- b. Maintenance Data Terminal (MDT)

CDRL F001	<u>Interface Control Document for Remote Maintenance Monitoring (RMM)</u>
CDRL F002	<u>Interface Control Document for the Maintenance Data Terminal (MDT)</u>

**C.3.10 NATIONAL AIRSPACE INTEGRATED LOGISTIC
SUPPORT (NAILS)**

C.3.10.1 NAILS Management

The Contractor shall designate a Logistics Manager to serve as the focal point for coordination with the Government on all matters relating to the management of NAILS. The Contractor shall establish and maintain a logistics organization to ensure that DMEs procured under this contract are fully supported for the duration of the contract. The NAILS program is the total set of tasks, both management and execution, required to accomplish the objectives as stated herein. The NAILS effort shall be conducted as an integral part of the program process.

C.3.10.2 NAILS Management Team

A joint Government/Contractor sponsored NAILS Management Team (NAILSMT) for the DME shall be established to serve as the primary management vehicle for monitoring the status of the NAILS program. The Contractor shall fully participate in and support the NAILSMT. The co-chairmen of the NAILSMT will be the FAA Contracting Officer Technical Representative (COTR) and the Acquisition Program Manager for Logistics (APML). The NAILSMT provides a means for coordinating and monitoring logistics related schedules and reviewing the adequacy, timeliness, and compliance with contractual requirements.

C.3.10.3 Provisioning

Provisioning constitutes the source coding of items, the preparation of stock lists and procurement documentation, and the acquisition and delivery of material. Initial provisioning is based on the Logistic Management Information (LMI) Data Products that includes the estimated maintenance factors.

C.3.10.4 Logistics Management Information

The Contractor shall develop and deliver data products contained on the LMI Data Product Worksheet and in the LMI data. The data products shall represent the physical top-down breakdown system design configuration to the component level including system, subsystems, components assemblies, subassemblies, support and test equipment and training equipment required. Data submitted shall be to the component level for all developmental items and to the Line Replaceable Unit (LRU) level for all COTS and non-developmental items. Any modification to a COTS item may disqualify it as COTS and may require LMI data to the component level. The Government will determine the

level of LMI data required for COTS modified items. The Contractor shall update the breakdown structure during the PCA and the Provisioning Conference (PC).

C.3.10.4.1 Logistics Management Information (LMI) Data Review

The Contractor shall host an LMI data review no later than 15 calendar days before the PCA. Topics shall include the Contractor's progress in LMI development and plans for the future efforts. The LMI Data Product shall be delivered in accordance with the CDRL. Additional data reviews shall be held at the discretion of the Government as circumstances warrant. The Contractor shall adhere to the data definitions, edits and data formats as described in MIL-PRF-49506, Appendix B and data product format of the DID. The Contractor shall deliver an initial LMI Data Product IAW CDRL G001.

CDRL G001	Logistics Management Information (LMI) Data Product
CDRL A003	Meeting Agenda
CDRL A004	Meeting Minutes

C.3.10.5 Provisioning Conference (PC)

The Contractor shall host and support a PC to be conducted at the Contractor's facility no later than 60 calendar days after successful completion of the formal PCA.

During the Provisioning Conference the Contractor, as a minimum:

- a. Shall deliver the final breakdown structure to the Government for approval.
- b. Shall make all DME drawings, proprietary and non-proprietary, available for Government to use as references. The Government will not copy or remove any proprietary data from Contractor's facility.
- c. Shall have copies of the Government FCA/PCA documentation available for use as a reference.
- d. Shall have systems, assemblies, and parts listed in the approved LMI data available for examination for the duration of the conference.
- e. Shall furnish technically knowledgeable personnel to disassemble the DME equipment to the extent required by the Government, and such tools as may be needed for disassembly/reassembly.
- f. Shall provide facilities, material, office space, clerical personnel conference room, access to telephone/facsimile, for the Government provisioning team and

Contractor personnel. The number of Government participants in the conference will be provided to the Contractor prior to the conference.

- g. Shall ensure the participation of Contractor and Contractor's personnel with detailed knowledge of the subject matter they represent, provisioning, provisioning and technical documentation, hardware/software maintenance, engineering and system design, etc.

At any time during the performance of the contract, the Government reserves the right to order updates to the LMI data that will be required to support additional PCs as required.

CDRL G001 Logistics Management Information (LMI) Data Product

C.3.10.6 Site Spares Requirements List

Site spares shall consist of one each unique Line Replaceable Unit (LRU) contained in the DME equipment excluding DME antenna elements. If the equipment contains more than one of the same LRU, only one spare LRU shall be provided. The site spare LRU must pass all production tests specified for that LRU as part of test procedures for the equipment specified in FAA-E-2996. The Contractor shall notify the Government of revisions to Attachment J-4, List of Site Spares, as approved configuration, equipment or data change.

An LRU is the lowest possible unit to be replaced within the system component during site level maintenance activities. It is a separate, installable physical package that performs a single function or group of closely related functions. For restoration purposes, an LRU is an assembly, printed circuit board, or chassis-mounted component that can easily be removed and replaced.

C.3.10.7 Tools and Test Equipment List (See C.3.3.3)

Special tools and test equipment (ST&TE) are tools and test equipment peculiar to the DME which are not readily available from other commercial sources and which are required for performing operational and maintenance tasks at the site and depot levels. ST&E includes test cables, connectors, extender kits, adapters, software, documentation/maintenance manuals, and all other ancillary items required to permit use of the special test equipment with DME hardware. Deliverable ST&TE shall be as listed in Attachment J-2. The Contractor shall notify the Government of revisions to Attachment J-2, List of Special Tools and Test Equipment as approved configuration, equipment, or data change.

C.3.10.8 Depot Level Maintenance

Depot level maintenance consists of repairing and/or replacing failed LRUs. Under this contract, depot level maintenance shall be performed by the Contractor as Contractor Depot Level Support (CDLS) for not greater than ten (10) years.

C.3.10.8.1 Contractor Depot Level Support

- a. The Contractor shall provide CDLS for all DME equipment delivered under this contract at the prices listed in Section B. The Contractor shall furnish all facilities, qualified labor, supervision, materials, documentation, piece parts, equipment, tools, and services required to perform depot-level repair and supply support of DME hardware, firmware, software, and ancillary equipment at the Contractor's facility. This service shall include issuing, stocking, receipting, repairing, inventory management or replacing Exchange and Repair (E&R), expendable, and consumable LRUs or other DME system hardware, firmware, or software; packaging, handling, and round-trip transportation costs to and from the Contractor's facilities and DME sites. The Contractor shall maintain a sufficient level of serviceable LRUs to ensure that repair priorities are met.
- b. The FAA Logistics Center (FAALC) Item Manager (IM) shall be the single point of contact for all maintenance actions between the operational site and the Contractor. The IM will coordinate all matters pertaining to shipping and tracking of failed equipment starting with the first commissioned system.
- c. All requisitions will be directed to the Contractor by means of FAA web-based requisitions described in C.3.10.8.2. The Government will provide the requisite access to the Logistics Information System (LIS) Interface Tool 30 days prior to the delivery of the first production system.
- d. If requested, the Government will provide training of the FAA Logistic Center Web-Based LIS Interface Tool to the Contractor as necessary. In the event that the web-based application is temporarily unavailable and an urgent need for shipment of an asset exists, the requisition may be identified to the Contractor by the IM via telephone. The document will include a tracking number. However, shipment is not authorized until the Contractor has received a fax or an electronic transmittal of the requisition from the IM.

C.3.10.8.2 Web-Based Requisition Interface Procedures

- a. The Contractor shall use the FAA Logistic Center Web-Based LIS Interface Tool to receive and process requisitions forwarded by the IM. The Contractor shall receive returned LRUs and complete all appropriate interface data fields, including the required asset and asset return information, originating site, LRU, and shipping information on a daily basis.

- b. The Contractor shall monitor the web-based tool for requisitions during normal business hours, Monday through Friday. In addition, the Contractor shall provide a 24-hour, 7 days per week point of contact by name and telephone number in the event that immediate shipment of an asset to a site is required outside listed working hours.

C.3.10.8.3 Repair Priorities

The following priorities will apply for shipment of all repaired or replacement LRUs to the field.

- a. Priority 1 – Shipment to the designated facility shall be made within 24 hours after receipt of notification by the FAALC IM, including nights and weekends. The IM will instruct the Contractor if special means of shipment is required, such as counter-to-counter delivery or next plane service to destination airport.
- b. Priority 2 – Door to door, next day air express shipment to the designated facility shall be made within 48 hours after receipt of notification by the FAALC IM, including nights and weekends.
- c. Priority 5 – Shipment to the designated facility shall be made within 7 calendar days after receipt of notification by the FAALC IM.

C.3.10.8.4 Shipping Labels

When the Contractor receives a requisition for a nonexpendable or non-consumable LRU, it shall ship the LRU to the site accompanied by a prepaid shipping label for use by site technicians in returning the failed LRU to the Contractor.

C.3.10.8.5 Line Replaceable Unit Repair Procedures

- a. All repaired items must comply with FAAD-STD-1293, Servicing Standards and Test Requirements for Ground Electronic Equipment, and all other applicable provisions of the contract.
- b. The Contractor must repair and test a repairable LRU to the extent necessary to restore it to a condition in which the item is capable of meeting all operational and functional requirements for which it was designed or as approved by the FAA. If the item is part of a system, then it must function in a manner, which will allow the complete system to meet all initial factory production operating tolerances. Minor cosmetic defects that do not affect the installation or operation of the item do not require correction or repair.

- c. Any Government mandated modifications to LRUs that have not previously been incorporated, must be accomplished by the Contractor at the time of repair.
- d. The Contractor must not replace LRUs with non-identical items unless approved by the Government, using existing NCP/ECP procedures and in accordance with guidelines contained in FAA Order 1800.66. Replacement piece parts must be identical in form, fit, and function, with respect to system operation, to the original parts identified in the approved system hardware baseline.
- e. Replacement LRUs must be in the current baseline configuration, not degrade performance of any part of the overall system; introduce incompatibilities with the normal operation of system elements; and /or impact the functions performed by, or degrade the performance of, the supplied software.
- f. CDLS shall include inspection and checkout of returned items that are thereafter determined to be in proper working order and not in need of repair. CDLS does not cover acts of God, negligence, and where not used in accordance with its design and intent.

C.3.10.8.6 Test and Inspection

Testing and inspection of repaired items shall be in accordance with the factory approved test procedures.

C.3.10.8.7 Reporting Requirements

The Contractor shall maintain an automated database of depot supply activities. The database shall be the basis for quarterly maintenance reports for monitoring the CDLS program and identifying trends that may require modification or correction.

CDRL G002 CDLS Activity and Repair Status Report

C.3.10.8.8 Depot Maintenance Transition Plan - Option

The Contractor shall prepare a Depot Maintenance Transition Plan. The plan will establish the schedule, activities, procedure and means for the orderly transfer of system support and maintenance management activities from the Contractor to the Government.

CDRL G003 Depot Maintenance Transition Plan - OPTION

C.3.10.9 Technical Instruction Books

The Contractor shall deliver Technical Instruction Books (TIBs) to support DME systems and equipment ordered under this contract in accordance with FAA-D-2494. Commercial manuals or Contractor format will not be acceptable.

CDRL G004 Technical Instruction Book

C.3.10.10 Technical Data Package

The Contractor shall provide a Technical Data Package (TDP) in accordance with MIL-DTL-31000. Data rights shall be as described in Section H.x. The data package will be delivered in an agreed to AUTOCAD format.

CDRL G005 Technical Data Package

C.3.11 TRAINING

C.3.11.1 Contractor Training - (Option)

The Contractor shall prepare training documentation and conduct maintenance training classes in accordance with this SOW. The Contractor shall revise and maintain all course materials, curriculum materials and courseware until accepted by the FAA.

C.3.11.1.1 Training Interface Meeting

The Contractor shall conduct a Training Interface Meeting no later than 60 calendar days after CDR approval. The meeting shall last no longer than two (2) days. The purpose of the meeting will be to discuss the requirements set forth herein and to:

- a. Establish a liaison and working relationship between the Contractor personnel and FAA training representatives
- b. Permit inspection of the Contractor's training facility
- c. Discuss proposed course development methods and requirements associated with each deliverable required from the Contractor
- d. Discuss the Contractor's plan for accomplishing the training
- e. Discuss classroom administration requirements

CDRL A003 Meeting Agenda
CDRL A004 Meeting Minutes

C.3.11.1.2 Training Materials, Equipment and Facilities

C.3.11.1.2.1 **Student Training Materials**

The Contractor shall provide each student with a complete set of course materials for the respective course. Course conduct shall make maximum use of all materials distributed. Student manuals and guides shall encompass a "how to" approach and work in concert with the instructor materials (lesson plans, PowerPoint presentations, figures, handouts, etc.). The Contractor shall furnish and maintain all reference, instruction, and student materials for each class. The Contractor shall make one set of Technical Instruction Books (TIB) available to each student during the training classes. At the conclusion of each class, students shall retain all student course materials issued to them including the TIB.

C.3.11.1.2.2 **Student Welcome Packages**

All students attending Contractor conducted training shall receive prior notification of the content and methods to be used in the training two weeks prior to the start date. This notification shall be provided to the Government in electronic format in the form of a Welcome Package and shall include a description of the course contents, directions to the Contractor's facility, class dates and times, list of housing facilities, restaurants, etc., for the local area.

CDRL H001 Student Welcome Packages

C.3.11.1.2.3 **Contractor Furnished Training Equipment**

The Contractor shall furnish all training equipment, safety equipment, including personal protective and material handling equipment, special tools, etc., necessary to conduct training. Equipment/system furnished for training development and/or conduct shall include all software, special tools, test equipment, simulators, emulators, and support equipment required to provide the end product or service. The Contractor shall maintain all equipment in an operable and usable condition except for planned disassembly and fault isolation training exercises.

C.3.11.1.2.4 **Contractor Furnished Training Site(s) and Facilities**

- a. Any training sites and/or facilities furnished by a Contractor are subject to inspection and approval by the Government. The following site/facility conditions will be appraised: space, lighting, noise, heating and cooling, safety of environment, cleanliness and sanitation, and furniture. The Contractor shall correct any known deficiencies identified before the start of Contractor training.
- b. The Contractor shall provide training aids such as chalkboards, projectors, viewgraphs, etc., as identified in training documentation.
- c. Only two students shall be assigned per workstation.

C.3.11.1.3 Government Furnished Training Equipment

If training is conducted at the FAA Academy, the Government will make all systems or other equipment to be used in training available to the Contractor. The Government shall maintain Government furnished training equipment in an operable and usable condition except for planned disassembly and fault isolation training exercises. Practical application activities requiring use of the system or equipment shall be coordinated with the FAA training representatives on site at least 24 hours prior to need.

C.3.11.1.4 Training Requirements

C.3.11.1.4.1 DME Maintenance Training for Airway Facilities (AF)

A course shall be developed for Airway Transportation Systems Specialists (ATSSs) who will be responsible for providing onsite maintenance for the DME. Training content shall address, but not be limited to:

- a. System Overview
- b. Theory or concepts of operation
- c. Maintenance concepts and responsibilities. Students shall be specifically instructed in services available to them under CDLS and their responsibilities in the use of FAA's Logistics Information System. The Contractor must coordinate presentation of this material with FAA Item Manager.
- d. System block and Line Replaceable Unit (LRU) diagrams
- e. In-depth parameters
- f. System and subsystem interface(s)
- g. Perform operational, functional, and adjustment checks in accordance with the manufacturer's instructions

- h. Perform routine periodic and preventive maintenance using the checks and procedures established for the DME.
- i. Conduct fault isolation and diagnostics procedures for failures to the LRU level and restore the equipment to operational service through removal and replacement of the faulted LRU
- j. Perform all required adjustments to restore the system to operational service following removal and replacement of the faulty LRU
- k. An overview of the system operation
- l. Demonstrate the ability to perform configuration, restoration, verification and certification of service.
- m. Perform software upgrades on remote site hardware
- n. Security
- o. Safety
- p. Perform flight inspection procedures and documentation

C.3.11.1.4.2 General Maintenance Course Requirements

The Contractor shall provide DME maintenance training via lecture and laboratory. The lecture and laboratory training shall be conducted at the Contractor's facility or a designated FAA site and shall meet these requirements:

- a. Formats for training materials shall be submitted by the Contractor to the Government for approval prior to use.
- b. Training shall be based on a Task and Skills Analysis (TASA) with cognitive and performance objectives directly derived from the TASA.
- c. Training materials shall be based on the system/equipment technical instruction book(s).
- d. Training course materials shall include an instructor manual and an instructor lab guide with detailed lesson plans for consistent training, a student manual and a laboratory manual with performance exercises to enable students to practice the skills being taught.

- e. On completion of the training, each student shall be able to perform all preventive maintenance as well as identify, isolate and correct faults to the LRU level (corrective maintenance). In addition, the training shall enable the students to understand the functional capabilities and operational concepts of the equipment/system.
- f. Class instruction shall be comprised of 50 percent lecture and 50 percent lab exercises.
- g. Each course objective shall be thoroughly tested in written and/or graded lab practical examinations.
- h. Written exams shall be multiple-choice items. The number of test items shall be sufficient to adequately measure student mastery of all the objectives.
- i. For written exams, each objective shall have three different versions of each exam item of equal difficulty.
- j. Exams shall be such that a student achieving a 70 percent score possesses the requisite knowledge of the equipment/system.
- k. All students shall be given the opportunity to complete written evaluations during, or at the end of, the conduct of training.

C.3.11.1.4.3 **Operational Test and Evaluation (OT&E) Training**

Prior to delivery of First Article systems for Government conducted tests, the Contractor shall provide a one-time class for up to 12 designated personnel who will participate in OT&E. Because OT&E will occur prior to the completion of the development and validation requirements described below, it is not necessary that the OT&E class conform to those requirements. However, it is necessary that the class familiarize attendees with installation and operation of the First Article systems to a level that will allow successful conduct of OT&E. The class shall be conducted two weeks prior to the start of OT&E and shall last no more than three days.

C.3.11.1.5 Task and Skills Analysis (TASA)

The Contractor shall prepare and submit a TASA Report for Government approval. The TASA Report shall identify the impact that the introduction of the DME equipment and technology will have on the current work force and identify the skills required to monitor, control or maintain it.

CDRL H002 Task and Skills Analysis Report

C.3.11.1.6 Training/Course Schedule

- a. Training shall be conducted on an 8-hour academic day, 5 days per week schedule. However, the first and/or last week of a class may be fewer than 5 days to accommodate student travel on a Monday or Friday. Students shall not be required to travel outside of normal working hours. Course instruction, labs, and testing shall be included in this time frame. Class instruction periods for lecture will be 50 minutes in duration with a 10-minute break between periods of instruction. The length of the practical application (laboratory exercises) may vary as the subject matter dictates.
- b. Class shall not be held on Federal Holidays. Federal holidays shall not be absorbed into overall course length. The Government will establish class start and stop times and class days.
- c. Maximum class size will be 8 students consisting of FAA technicians, engineers and/or supervisors. The student-to-instructor ratio may be no greater than 8-1 for classroom training and no greater than 4-1 for lab training. The number of DME systems available for laboratory exercises will determine the final class size based on two students per DME system.
- d. To meet urgent installation and/or fielding requirements, the Government may direct the Contractor to conduct a second shift or an accelerated training schedule. If so directed, the Contractor shall conduct training to accomplish all instructional activities while maximizing use of the system or equipment.
- e. The Contractor shall develop course schedule(s) to be included with the student training materials. The schedule(s) shall provide an overview of the course chronology and shall show the major segments of the course and the respective time allotments. The schedule shall be updated throughout the development process as needed.

CDRL H003 Course Schedule

C.3.11.2 Government Training (Option Items)

C.3.11.2.1 Developmental Training Materials

If the Government determines that a training development effort is required, it may order one or more of the following deliverables for use by the FAA Training Academy. The materials will be developed in accordance with FAA-STD-28.

CDRL H004 Training Development Plan - Option

CDRL H005 Course Design Guide - Option

CDRL H006 Tests - Option

CDRL H007	Classroom Training Materials - Option
CDRL H008	Theory of Operations Examination - Option
CDRL H009	On-the-Job Training (OJT) Materials - Option
CDRL H010	Performance Examination - Option

C.3.11.3 Instructional Program Reviews

The Contractor shall conduct Instructional Program Review (IPR) meetings for training. These are formal presentations by the Contractor to the Government concerning the progress that has been made on the training effort to date. The Government will schedule IPRs as needed.

C.3.11.4 Validation of Contractor and Government Training Courses

C.3.11.4.1 Contractor's Presentation

- a. The Contractor's Presentation is a formal step in the validation of the training materials. During the presentation, the Contractor shall give a shortened version of each lesson, including test items. Each lesson shall be given in enough detail and depth that the integration and effectiveness of the instructional materials, learning sequence, performance exercises, tests and the time allocations can be fully assessed by the Government.
- b. The Contractor's Presentation shall be conducted at the Contractor's facility using materials that will be used in the actual training course. Contractor personnel responsible for the design, development, and technical accuracy of the training materials shall be available during the presentation to answer questions about the course. In addition, if the Government requests their presence, the Contractor shall require additional Contractor personnel, including instructors, developers, and appropriate subject matter experts be available for questions during the presentation.
- c. The Contractor shall correct errors, omissions, and deficiencies in student and instructor materials discovered during the Contractor's Presentation and shall submit corrected copies of the course materials for Government review and approval. The Contractor shall also ensure that all copies requiring correction are corrected prior to their use in any class.

CDRL H011	Contractor's Presentation
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C.3.11.4.2 Operational Tryout

- a. The Operational Tryout is a continuation of the training materials validation process. Complete lessons are presented to representatives of the target population to determine if the instructional approach is appropriate and effective,

test items and time allocations are appropriate, and the format of the materials is easy to use. An Operational Tryout Plan shall be submitted in accordance with the below CDRL.

- b. The Operational Tryout shall be conducted at the Contractor's facility and must be planned to last one and a half times the length of the proposed course. Government representatives selected as monitors shall not count against the class enrollment.
- c. The Contractor shall submit an Operational Tryout Report in accordance with the below CDRL upon completion of the Operational Tryout. The Operational Tryout shall not count against the number of classes to be conducted by the Contractor.
- d. Subsequent classes shall not commence until a successful Operational Tryout has been conducted and approved by the Government.

CDRL H012 Operational Tryout

C.3.11.4.3 Course Evaluations

All students shall be given an opportunity to complete written evaluations during or at the end of the training. The Government will provide the evaluation forms to the Contractor for distribution to the students. The forms will include student lesson critiques, time logs, errata sheets, end of course critiques, etc. During Operational Tryout the Government will review the forms and identify necessary changes to training materials. The Contractor shall incorporate the revisions and submit the updated documentation IAW the below CDRL. At subsequent classes, the Contractor will administer the evaluation forms and forward them to the Government.

CDRL H013 Updated Training Materials

C.3.11.4.4 Certificate of Training

The Contractor shall deliver a certificate of training to each student who successfully completes the training. The certificate shall contain at a minimum student name, length of training in hours, course number and title, exam scores, location of training, date completed, and issuing official. The contractor shall provide the Government a list of the certified trained students after each class.

C.3.12 ENGINEERING SUPPORT SERVICE

When ordered by the Government, in accordance with Section H.x, the Contractor shall provide engineering support to perform tasks including, but not limited to, assistance in OT&E, operational, and field shakedown tests, contractor training in the field, troubleshooting, and correction of problems that may arise after successful completion of tests. If a task order requires Contractor personnel to have unescorted access to FAA facilities, the Contractor shall comply with the provisions of AMS clause 3.14-2 of Section I, Contractor Personnel Suitability Requirements.

C.3.13 SYSTEM SAFETY REQUIREMENTS

The Contractor shall conduct a System Safety Program (SSP) as described below. The following references provide for specific SSP tasks: FAA Order 8110.105, FAA Order 8110.49, FAA document ATO-S 2006 SRMGSA, MIL-STD-882, SAE ARP 4754, SAE ARP 4761, RTCA/DO 178, RTCA/DO 278, and RTCA/DO 254. The SSP is designed to identify, evaluate and mitigate safety risks associated with the DME system, to identify the safety requirements and risk controls applied in the design of DME system, to verify the reliable implementation of safety requirements and risk controls, and to minimize risk of hazard to equipment and personnel.

C.3.13.1 System Safety Program Plan (SSPP)

The Contractor shall submit a SSPP. It shall include all safety activities from contract award to delivery and acceptance of the System Safety Assessment Report (SSAR). The SSPP shall also include all software and hardware design, development, testing and production activities conducted prior to contract award. The SSPP shall outline how the Contractor will show that the system was planned/originated in accordance with the safety documents required by this SOW. It shall contain the Contractor's program to hire an FAA approved Independent Verification and Validation (IV&V) Contractor and how the IV&V Contractor will be integrated into the design, development, and testing programs. The SSPP shall be approved by the Government and become the outline of all safety related contract requirements.

The Contractor's SSPP shall be designed and implemented to provide an approved SSAR that the DME system (hardware and software) is safe for operation in the NAS. The SSPP shall include, as a minimum, the following components:

- a. All methods and processes that will be conducted under the SSP, to include a schedule for completion of all SSP activities, and identify the relationships and activities with the other requirements of this SOW.
- b. Address how the Contractor will develop the Contractor's Functional Hazard Assessment (FHA) based on the Government provided Operational Safety Assessment (OSA) (Attachment J-x), the Preliminary System Safety Assessment (PSSA), the System Safety Assessment (SSA) and the SSAR.

- c. Address how the Contractor will successfully conduct a Fail Safe Demonstration.
- d. Address how the Contractor will plan for the IV&V audit that validates the SSAR and all activities leading to its completion and guarantees the DME safe for use in the NAS.

CDRL I001 System Safety Program Plan

C.3.13.2 Safety Assessment

The Safety Assessment tasks include, as a minimum, a FHA, PSSA, SSA and a SSAR. The purpose of the Safety Assessment tasks includes assessment of the functional hazards, definition and allocation of the safety requirements, description of the safety architecture, specification of the component-level (critical element) assurance requirements, evaluation of the component-level failure modes, and assessment of the system safety compliance with the safety requirements identified in FAA-E-2996.

C.3.13.2.1 Functional Hazard Assessment (FHA)

The Contractor shall develop a FHA based on the Government provided OSA. The system level FHA is a qualitative assessment which is iterative in nature and becomes more defined and fixed as the system evolves. The FHA shall be developed in accordance with SAE ARP 4761, Appendix A.

CDRL I002 Functional Hazard Assessment

C.3.13.2.2 Preliminary System Safety Assessment

The Contractor shall develop a Preliminary System Safety Assessment in accordance with SAE ARP 4761, Appendix B. The PSSA process is a systematic examination of a system architecture to determine how failures can lead to the functional hazards identified by the Functional Hazard Assessment (FHA), and how the FHA requirements will be met. The PSSA process is interactive and associated with the design definition. Just as the design process is iterative, the PSSA process is iterative. The PSSA process is continuous throughout the design cycle.

CDRL I003 Preliminary System Safety Assessment

C.3.13.2.3 System Safety Assessment

The Contractor shall develop a System Safety Assessment in accordance with SAE ARP 4761, Appendix C. SSA is a systematic examination of the system, its architecture and

its installation to show compliance with the safety requirements. For each PSSA carried out at a different level, there should be a corresponding SSA. The highest level SSA is the system level SSA. For each system analyzed, the SSA summarizes all significant failure conditions and their effects on the system. The methods of analysis used to show compliance may be either qualitative or quantitative.

CDRL I004 System Safety Assessment

C.3.13.2.4 System Safety Assessment Report

- a. The Contractor shall develop a System Safety Assessment Report (SSAR) 60 days after successful completion of the DQT performed under this contract. The SSAR shall be a finalization of the SSA. In addition to the SSA findings and results, the SSAR shall capture hazards, associated Safety Requirements, and required Safety Analyses resulting from the development of interface capabilities required under this contract effort.
- b. Any changes to the system or software design are evaluated against the allocations and budgets established in the System Safety Architecture specification, repeating the analysis methods applied in the PSSA.
- c. The SSAR constitutes the safety baseline for the DME system. This allows for maintenance of the safety baseline and safety requirement compliance throughout the system lifecycle.

CDRL I005 System Safety Assessment Report

C.3.13.3 Hardware/Software Assurance

The Contractor shall acquire/develop, document, test, and manage all system hardware and software provided or developed under this contract. The hardware and software developed under this contract shall use the development and documentation processes contained in RTCA/DO 178, RTCA/DO 278, RTCA/DO 254 and SAE ARP 4754 and SAE ARP 4761. FAA Orders 8110.105 and 8110.49 shall be used to define the applicability of RTCA/DO 178 and RTCA/DO 254. All FAA personnel or designees are authorized to inspect all hardware and software documentation, practices or procedures of the Prime Contractor. The Prime Contractor shall make available all subcontractors' documentation, practices and/or procedures.

The Contractor shall develop a Hardware Development Program Plan (HDPP) that describes the development approach, methodologies, tools, and procedures to be used during the analysis, design, development, testing, integration, deployment, and maintenance of the hardware for the DME. The HDPP shall include the methods for verification and validation of data, traceability of requirements, and hardware analyses.

It shall identify the standards used for requirements, design, verification, and archiving. The HDPP shall also include the plans for test procedure development, test results recording, acceptance criteria, and maintaining assurance records.

The Contractor shall develop a Software Development Program Plan (SDPP) for conducting a software development effort. The term "software development" is meant to include new development, modification, reuse, reengineering, maintenance, and all other activities resulting in software products. The SDPP shall include the methods for verification and validation of data, traceability of requirements, and hardware analyses. It shall identify the standards used for requirements, design, code, verification and archiving. The SDPP shall also include the plans for incorporating software quality assurance (SQA) records and maintaining software verification results.

CDRL 1006	Hardware Development Program Plan
CDRL 1007	Software Development Program Plan

C.3.13.3.1 Hardware Assurance

The Contractor shall develop hardware design assurance methods and processes in accordance with RTCA/DO-254 and SAE ARP 4754.

- a. A hardware item is identified as simple only if a comprehensive combination of deterministic tests and analyses appropriate to the design assurance level can ensure correct functional performance under all foreseeable operating conditions with no anomalous behavior. When an item cannot be classified as simple, it is complex. An item constructed entirely from simple items may itself be complex. Items that contain a device, such as an Application-Specific Integrated Circuit (ASIC) or a Field-Programmable Gate Array (FPGA) shall be considered complex.
- b. The Contractor shall use hardware design processes to develop a hardware item that fulfills the requirements allocated to the hardware from the systems requirements in FAA-E-2996. These processes, their objectives and related activities are intended to reduce the probability of design and implementation errors that affect safety.
- c. Specific products required for hardware assurance are listed in paragraph C.3.13.3.2.

C.3.13.3.2 Hardware Documentation

As a minimum, the listed hardware documentation shall be required under this contract. Other hardware documentation may be requested to meet the requirements of the System

Safety Program. Required hardware documentation shall be delivered in accordance with the CDRLs below.

CDRL I008	<u>Hardware Test Plan</u>
CDRL I009	<u>Hardware Test Procedures</u>
CDRL I010	<u>Hardware Test Report</u>
CDRL I011	<u>Hardware System/Subsystem Design Document</u>
CDRL I012	<u>Hardware Configuration Index</u>
CDRL I013	<u>Hardware Lifecycle Environment Configuration Index</u>

C.3.13.3.3 Software Assurance

- a. The Contractor shall substantiate developmental software to the appropriate level of assurance according to RTCA/DO-278.
- b. Based on the Safety Assessment activities, safety requirements and hazard mitigation/control functions are allocated to software CIs. For an individual software CI, the required assurance level is assigned directly from the worst-case failure impact severity associated with any function allocated to the software CI. The assurance level in turn defines the objectives of DO-278 to be applied to the software CI.
- c. The System Software Support task specifies that software development and documentation processes are performed in accordance with FAA-STD-026a. The application of that standard provides for documentation and records that represent evidence of the software development planning, processes, standards, specifications, designs, controls, and quality assurance required for compliance with RTCA/DO-278. Specific products required by the System Software Support task are listed in paragraph C.3.13.3.4.

C.3.13.3.4 Software Documentation

As a minimum, the listed software documentation shall be required under this contract to support software safety assurance and software maintenance. Other software documentation may be requested to meet the requirements of the System Safety Program depending on the assurance level. Required software documentation shall be delivered in accordance with the CDRLs below.

a. Software Safety Assurance Documents

CDRL I014	<u>Software Configuration Index Records</u>
CDRL I015	<u>Software Requirements Specification</u>
CDRL I016	<u>Software Requirements Standards</u>
CDRL I017	<u>Software Design Description</u>
CDRL I018	<u>Software Design Standards</u>
CDRL I019	<u>Source Code</u>

CDRL I020	Executable Object Code
CDRL I021	Software Code Standards
CDRL I022	Software Program Manual
CDRL I023	System Segment Specification
CDRL I024	Item Development Specification
CDRL I025	Software Test Plan
CDRL I026	Software Test Procedures
CDRL I027	Software Test Report
CDRL I028	Software Product Specification
CDRL I029	Software Environment Configuration Index

b. Software Maintenance Documents

CDRL I030	Software Users Manual
CDRL I031	Master EPROMs
CDRL I032	Firmware Support Manual
CDRL I033	Memory Hex Dump

C.3.13.4 System Safety Requirements Verification

The Contractor shall obtain the services of a FAA approved organization/contractor to conduct an independent verification and validation (IV&V) of the SSP. It is envisioned that the IV&V Contractor will be involved from the start of the contract and will conduct independent audits throughout the design, development and testing lifecycles. The IV&V processes and methods shall ensure that the software and complex hardware have been designed and developed in accordance with FAA Order 8110.105, FAA Order 8110.49, ATO-S 2006 SRMGSA, MIL-STD-882, SAE ARP 4754, SAE ARP 4761, RTCA/DO 178, RTCA/DO 278, and RTCA/DO 254. The FAA reserves the right to audit the IV&V activity at any time.

- a. The IV&V Organization/Contractor shall verify the full implementation of the safety requirements and hazard mitigations/controls identified from the execution of the Safety Assurance Program. Safety requirements derived from the Safety Assurance Program are expected to include integrity monitoring and failsafe requirements, continuity of service performance requirements, and personnel hazard controls or mitigations.
- b. The IV&V Organization/Contractor shall provide for the verification of safety requirements and hazard mitigations or controls. Verification is accomplished at the level of specification or implementation, where practicable. For example, functions allocated to a software CI are verified during software test of the CI. Identified test levels include software CI, hardware CI, DME subsystem, and DME system. In particular, system-level integrity requirements are verified through analysis and test. The Maintainability Demonstration supports the verification of procedural and physical mitigations/controls for personnel hazards.

- c. The result of the IV&V effort shall be a validated SSAR assuring the DME is safe for use in the NAS. The SSAR shall be forwarded to the FAA under signature from the Contractor and the IV&V Organization/Contractor.
- d. All documentation required for hardware and software shall be made available to the IV&V Organization/Contractor to support his system safety verification.

C.3.13.5 Safety Configuration Management

The Contractor shall apply their Configuration Management Program to the artifacts produced under the System Safety Program. The safety artifacts shall be version controlled following first submission to the FAA. The safety artifacts shall be integrated into the product baseline to document the safety compliance of the system configuration baseline. Proposed changes to the system baseline shall include assessment of impact and identification of changes to the safety artifacts.

C.3.13.6 Fail-Safe Demonstration

The contractor shall demonstrate that failure of any part of the monitor shall automatically produce the same results as the malfunction of the element being monitored. The Fail Safe Demonstration shall comply with the requirements set forth in AC/AMJ 25.1309, RTCA DO-278, RTCA DO-254, SAE ARP 4754 and SAE ARP 4761.

The Contractor shall conduct a Fail-Safe Demonstration on a system at the Contractor's facility. The demonstration shall be conducted by introducing failures to the monitor and control subsystems while the system is operating normally. The demonstration shall show that failure of any part of the monitor subsystem shall:

- a. Result directly in an alarm indication, and
- b. Not alter any alarm threshold so that alarm tolerances are widened, and
- c. Be detected by an automatic system integrity test, and
- d. Result in the immediate removal of service.

In addition, the demonstration shall show that failure of the control subsystem shall either:

- a. Result in an immediate shutdown of the DME, or
- b. Not inhibit the control subsystem from responding properly to an alarm condition detected by the monitor subsystem,
- c. Log the time and cause of the failure.

The Fail-Safe Demonstration shall not start until the Contractor has:

- a. Successfully completed DQT or FAT on the First Article designated for the Fail-Safe Demonstration,
- b. Established and controlled the HW/SW configuration in accordance with paragraph C.3.7.1, and
- c. Obtained Government approval of the Fail-Safe Demonstration Plan and Test Procedures.

The Fail-Safe Demonstration shall not be considered complete until the Contractor has:

- a. Successfully executed all test procedures, witnessed by the Government,
- b. Generated Problem Technical Reports (PTRs) for each failure,
- c. Resolved all PTRs to the extent that the PTRs have been fixed and tested or deferred to a later release with Government approval, and
- d. Obtained Government approval of the Fail-Safe Demonstration Test Report.

The Contractor shall develop the Fail-Safe Demonstration Plan, Procedure, and Report in accordance with the CDRLs listed below.

CDRL I034	Fail-Safe Demonstration Test Plan
CDRL I035	Fail-Safe Demonstration Test Procedures
CDRL I036	Fail-Safe Demonstration Test Report

C.3.13.7 Hazard Tracking and Risk Resolution (HTRR)

Hazard Tracking and Risk Resolution (HTRR) is a method of documenting and tracking hazards and verifying their controls after the hazards have been identified. Its purpose is to ensure a closed-loop process of managing safety hazards and risks. The FAA has established a Hazard Tracking System (HTS) to accomplish HTRR. It is not intended for accident/incident reporting.

The contractor must ensure that:

- a. When a safety analysis is completed or an incident analysis identifies a hazard, all identified hazards are recorded in a unique record (i.e., a Safety Action Record (SAR)) and provided to the FAA for inclusion in the HTS
- b. Medium and High Risk hazards are tracked to closure. However, all safety requirements (including those for low risk hazards) must be validated and verified.

Each Safety Action Record includes:

- a. A description of the hazard status
- b. An updated narrative history of changes to the SAR (e.g., verification status changes)
- c. A current risk assessment
- d. A rationale for the risk severity and probability, including existing controls and SRVT requirements
- e. A mitigation and verification plan for each safety requirement
- f. Potential effects if the hazard is realized

Each SAR must be classified according to status in accordance with the Table below.

Status	Definition
Proposed	The hazard has been identified, and the SAR has been written. The SAR has not been reviewed or approved by the ATO System Safety Working Group (SSWG).
Open	The SAR has been approved by the ATO SSWG. Mitigation and verification plan have not been developed.
Monitor	The SAR has been approved by the ATO SSWG. A mitigation and verification plan for the SAR exists and has been approved by program management. Results of the mitigation and verification plan are forthcoming.
Recommend Closure	All mitigation and verification actions are complete. The SAR is awaiting review by the ATO SSWG, Status and residual risk will then be determined.
Closed	No further action is needed. The SAR is closed by the ATO SSWG and forwarded to Director of SRM for review and coordination of risk acceptance by the appropriate management activity.

CDRL I037 Safety Action Record

C.3.13.8 Personnel Safety Compliance

The DME shall comply with applicable regulations and guidelines related to employee safety and health in accordance with FAA Order 3900.19, FAA Specification FAA-G-2100, and Occupational Safety and Health Administration (OSHA) standards contained in 29 CFR 1910 and 29 CFR 1926. The Contractor shall submit a Personnel Safety Hazard Analysis Report in accordance with the below CDRL.

